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U.S. Environmental Protection Agency
Science Advisory Board
Health and Ecological Effects Subcommittee (HEES) of the
Advisory Council on Clean Air Act Compliance Analysis (Council)

Summary Minutes of Public Meeting
(April 21-22, 1999)

Committee: Health and Ecological Effects Subcommittee (HEES) of the Advisory Council on Clean Air Act Compliance Analysis (Council) of the U.S. Environmental Protection Agency's Science Advisory Board (SAB). (See Roster - Attachment A.)

Date and Time: Tuesday, April 21, 1999, from 9:30 a.m. to 5:30 pm and Wednesday, May 22, 1999, from 9:00 a.m. to 1:00 p.m. Eastern Time (See Federal Register Notice - Attachment B).

Location: Latham Hotel, 3000 M Street, N.W., Washington, DC, 20007.

Purpose: To review background materials for the draft *Prospective Study: Report to Congress*, with a focus on the health and ecological aspects of the Clean Air Act Amendments (CAAA) Section 812 Prospective Study data, methodology, results and documentation of human health effects, and ecological effects. (See Meeting Agenda - Attachment C.)

Atttendees: Committee Members [Dr. Paul Lioy, Dr. A. Myrick Freeman, Dr. Jane V. Hall (via conference call on April 21, 1999, from 4-5:30 Eastern time), Dr. Michael T. Kleinman, Dr. Timothy V. Larson, Dr. Morton Lippmann, Dr. Joseph S. Meyer, Dr. Robert D. Rowe, Dr. Carl Shy, Dr. George T. Wolff- all current members participated - see Attachment A]; Dr. Angela Nugent (Designated Federal Official - SAB Staff). Speakers included Mr. James DeMocker (of the Office of Air and Radiation, EPA); Dr. Brian Heninger (of the Office of Policy, EPA); Mr. Jared Hardner (of Industrial Economics, Incorporated); Dr. Bryan Hubbell (of the Office of Air and Radiation, EPA); Dr. Leland Deck (of Abt Associates); and Ron Evans (of the Office of Air and Radiation, OAR). (See Meeting Sign-In Sheets for other Attendees - Attachment D.)

Meeting Summary:

The presentations and discussions at the meeting followed the issues and

general timing as presented in the meeting Agenda, except where otherwise noted (see Meeting Agenda - Attachment C). The Agenda was structured to follow closely the charge questions submitted by the Agency (see Charge to the HEES - Attachment E). There were no written comments submitted to the Committee, nor were there any requests made to present public comments during the meeting.

Welcome and Introductions - Dr. Paul Lioy, Chairman, opened the meeting at 9:30 a.m. welcoming members and consultants, and reviewed the meeting agenda (Attachment C). Dr. Angela Nugent, Designated Federal Official for the HEES reviewed the materials which had been provided to Committee and noted that a complete set of materials was available at the meeting for reference purposes. Then she requested that panel members introduce themselves and make a voluntary statement for the record regarding their research interests and experiences related to the review topic. No "particular matter" conflicts of interest were identified by the members or consultants.

Overview of Human Health and Ecological Effects Modeling for the Section 812 Prospective Study

Dr. James DeMocker presented an overview of the key issues for the HEES. He outlined the seven Charge questions provided to the HEES and how background material on those Charge questions would be presented at the HEES meeting by Agency Staff and contractors. He provided handout materials to complement his presentation.

He also summarized for the committee several key issues raised by the Council and the Air Quality Monitoring Subcommittee (AQMS) concerning the Section 812 Study. He reported that key issues for the AQMS included: (1) reconciliation of the 812 prospective study primary PM projections and recent historical PM trends; (2) method to achieve geographically comprehensive baseline monitoring data; and (3) progress toward improved emissions inventories and integrated Models-3 system to support future prospective studies. Key issues for the Council included: (1) the AQMS concern regarding primary PM emission inventories; (2) consideration of alternative paradigms for valuation of premature mortality; and (3) the HEES concerns regarding ecological benefits. The Agency will be addressing those issues at its upcoming meeting with the AQMS on May 4-5, 1999 and at the meeting being planned for the Council on July 13-14, 1999.

He outlined the next steps in developing the Section 812 Study by presenting a schedule that assumed that the deadline for delivering the final Report to Congress would be delayed to November 15, 1999. The delay would allow for completion of the primary benefits calculations and uncertainty analysis by August and complete configuration of supplemental reduction scenarios and running of air quality and benefit models by September, with "review closure with SAB Council, HEES, AQMS" in early October.

If delay beyond the August deadline is not allowed by negotiation or legal

decision, the Agency would complete the benefits calculations and uncertainty analyses by an earlier deadline and supplemental reduction scenarios would not be run.

Ecological Assessment Framework and Approach

Dr. Brian Heninger (of the Office of Policy, EPA) presented a summary of the approach being taken to characterized the benefit of regulations promulgated under the Clean Air Act Amendment over the period 1990 to 2010 as they relate to mitigation of ecological impacts from air emissions. He provided a set of handout materials to complement his presentation. He described three steps in the approach: (1) identification and characterization of ecological impacts from air pollution; (2) development and application of selection criteria for quantitative and qualitative assessment of ecological impacts; and (3) quantitative and qualitative analyses of selected impacts. Dr. Heninger presented the Ecological Framework used to characterize impacts. The Framework offers a matrix that describes the interactions between different kinds of air pollution and natural systems at various levels of organization. Mr. Jared Hardner of Industrial Economics, Incorporated then described three selection criteria derived for assessing ecological impacts: (1) ecological impacts should be representative of efforts influenced by the Clean Air Act Amendments; (2) ecological effects must have associated service flows; and (3) there must be a defensible link between changes in emissions and changes in ecological service flows. He then described several impacts that met the criteria and the assessments being conducted for each service flow. These included eutrophication of estuaries, acidification of freshwater bodies, timber growth declines, aesthetic damages to forests, and toxification of freshwater bodies.

The Subcommittee commended the Agency on the development of the framework and the application of the selection criteria. Subcommittee discussion focused on: (1) the need to have results from the assessments as soon as possible; (2) the importance of describing in the Section 812 Study specific research needs that would allow a more complete valuation of impacts on ecological systems by the time of the next prospective study. Other issues included the need to: (1) enhance selection criteria so that results would be less “opportunistic” and more strategic, specifically by developing criteria to increase focus on effects where there may be significant quantitative or monetary benefits, (e.g., effects at the ecosystem or watershed level); (2) address the limitations of adopting PNET model to assess timber growth declines; (3) address the importance of a systems approach in the body of the report and not relegate it to appendix material; (4) focus more on quantification of benefits that are not amenable to monetization; and (5) address such nonlinear effects of pollutants as nitrogen deposition.

In this session, the Subcommittee touched on several issues that applied to assessments of both ecological and human health effects. Members discussed the need to: (1) articulate clearly the relationship between the analyses in the retrospective and prospective studies and (2) meet a dual charge of (a) conducting a benefit analysis

now based on available data and methods and (b) identifying clear needs for research that will improve future benefits analyses in the short and medium-term so that future benefits analyses can be improved.

Action item:

1. Dr. Robert Rowe will forward additional comments related to economic issues and not strictly relevant to the Charge Questions for the HEES to Dr. Myrick Freeman for discussion with the Council

Ozone Mortality

Dr. Bryan Hubbell gave a presentation of a proposed meta-analysis method to estimate the mortality benefits realized by reaching the new National Ambient Air Quality Standards for ozone by the year 2010. He provided a set of handout materials to complement his presentation. The committee began its discussion by asking about the weighting factors applied in the meta-analysis. There was a suggestion to develop a scheme to provide different weights for countries with different Gross Domestic Products (GDPs); in general two Latin American countries have low GDPs and their underlying mortalities are different.

The discussion then turned to issues associated with the Philadelphia study that drove the results of the meta-analysis. Committee members emphasized the need to establish how 24-hour ozone exposures in that study relate to 1-hour ozone exposures. They also discussed ambiguities introduced by co-pollutant effects and seasonal effects and the lack of standardization of species of PM reported in different studies.

The Subcommittee found the meta-analysis approach interesting and a step in the "right direction," but the HEES did not think, due to the lack of adequate control of potential fin confounders in some of the studies, that the set of studies incorporated in the ozone mortality met presented at the meeting should be used to estimate a separate ozone effect for air pollution-relat health effects. Members remarked that the datasets chosen were "a messy set of data" and that there was a need to look at relationships between different pollutants and different fractions of pollutants. Mr. DeMocker noted that the Council had called for the Agency to disaggregate by pollutant and asked if there were value in providing the meta-analysis study for ozone mortality as an Appendix to the Study. Dr. Lioy said that at the present time the analysis was not defensible and that he and Dr. Freeman would carry the HEES message to the Council.

The Subcommittee also explored an issue common to assessments of both ecological and human health effects. Several committee members asked whether it might be appropriate at some point in time to conduct a meta-analysis on ecological effects. Regardless of the approach adopted by EPA, it might be desirable for the health and ecological benefits approaches to be consistent.

PM Mortality Thresholds

Mr. DeMocker and Dr. Leland Deck of Abt Associates began the discussion by

asking the HEES for guidance on the language in the February 1999 Advisory (EPA-SAB-Council-ADV-99-005), which recommended that PM 2.5 level of 15 $\mu g/m^3$ be an assumed threshold for adverse health effects analyses. They referred the committee to page 13 of the report. They reported that the Agency and others had interpreted the language as establishing a "gold standard" for the analysis. The Subcommittee responded that the recommendation had been made only in the context of asking for a sensitivity analysis at three different levels, 0, 15, or 20 $\mu g/m^3$. There was no intent to convey the notion that 15 $\mu g/m^3$ is a scientifically defensible threshold. At this time, there are no data to support a threshold at, above or below 15 $\mu g/m^3$.

Action item:

2. Chairman Lioy will prepare a letter clarifying that the HEES Advisory (EPA-SAB-Council-ADV-99-005) intended to call for a sensitivity analysis, not an effects threshold.

Issues in Charge Questions 5 and 6

Mr. DeMocker and Dr. Deck engaged the HEES in discussion of several questions involving mortality and morbidity assessments related to criteria air pollutants. They provided a set of handout materials to complement his presentation. The Subcommittee generally emphasized the need for the Study to provide a summary of omissions, biases and uncertainties associated with the data and assessments used. Members suggested that the Agency use the mean, not the median, in applying the Pope data. Members again emphasized that insufficient data existed to demonstrate PM-related mortality from ozone exposure and suggested that the Agency watch the issue carefully for the next prospective study.

The discussion turned to assessments of morbidity, based on hospital admissions. The HEES commented on the many uncertainties involved with the use of hospital admissions and relating such information to exposure to criteria air pollutants. Members made several suggestions, given the uncertainties with the data: (1) include as many good studies as possible; (2) follow the model established by the ecological assessment of developing criteria for including studies; (3) retain studies of populations of different ages (e.g., over 65, infants/children) and developing slope functions for each to test whether it is appropriate to use a single slope for the whole population; (4) conduct a meta-analysis of studies related to asthma; (5) deal with multiple pollutant effects by developing indices for PM, ozone, and combustion air pollutants--indices would reduce the "noise" of multiple pollutants acting together; and (6) conduct separate analyses for the summer seasons.

The Subcommittee then engaged the issue of Regional Concentration-Response Functions. Dr. Jane Hall, lead discussant for this issue, participated by conference call. The Subcommittee generally agreed that methods and data do not currently exist to provide health assessments for criteria pollutants on a regional basis. They pointed to several potential areas of research, including data from hospitalizations that could be

analyzed by region, age and socio-economic category and sensitivity analyses of emerging studies. The committee also pointed out that the national orientation of health assessments was quite different from assessment of ecological effects, where data is quite specific to location and region.

Next, the HEES discussed the Agency's proposed approach for assessing bronchial effects. Members noted many issues associated with the data on incidence of chronic bronchitis. The single study with incidence data presented by the Agency, the Abbey study, involved Seventh Day Adventists and would be difficult to extrapolate to the national population. Mr. DeMocker emphasized the importance of bronchitis to the "bottom line" of the assessment. Bronchitis was associated with 15% of total benefits in the Retrospective Study and may represent a greater percentage in the Prospective Study. Members of the Committee suggested: (1) analyzing the Framingham longitudinal study to derive prevalence data from that to qualify the results from the Abbey study; (2) using the Schwartz data and acknowledging its limitations; and (3) referencing new study by McDonnell et al. on chronic asthma and chronic bronchitis as suggested by Dr. Lippmann. The Subcommittee also asked the Agency to reexamine its exclusive reliance on the Pope et al. (1995) study to estimate PM-related premature mortality in light of the potential comparative statistical strength of the Dockery et al. Six-Cities study which had better air pollution data. The Subcommittee recommended that the Project Team provide estimates of PM-related premature mortality based on the Six-Cities study as an alternative or additional calculation.

Hazardous Air Pollutant Benefits

Ron Evans (of the Office of Air and Radiation, OAR) presented a response to SAB concerns in previous reports about benefits for air toxics and presented EPA's preliminary approach for developing tools and information.

A major focus for discussion was the question of whether the Agency had developed an approach for coordinating benefits assessments for Hazardous Air Pollutants and Criteria Pollutants (HAPs). Mr. DeMocker remarked that EPA staff had developed an initial draft of a "white paper" proposing an adjustment algorithm, but that Dr. Joel Schwarz had provided the Agency with a note indicating that such a methodology may have technical problems. The Subcommittee asked to receive this memorandum.

Mr. DeMocker and Dr. Carl Mazza (of the Office of Air and Radiation, EPA) emphasized the importance of improving the approach to benefits for air toxics. Dr. Mazza also stated that improvement of monitoring methods and emissions modeling for air toxics will not only support the Section 812 Study, but also is necessary to implement the program's regulatory program related to hazardous air pollutants.

The Subcommittee discussed recommending that SAB Executive Committee form a special subcommittee, perhaps with members from the Environmental Health and the Integrated Human Exposure Committee, to consult with the Agency on whether and how to make consistent estimates of risk for hazardous air pollutants and criteria

pollutants. They pointed out that the two existing approaches to hazard assessment, conservative estimates in HAPs vs. best estimates in Criteria Pollutants, could not be compared and that there was a "total lack of information to convert emissions to ambient exposures" for air toxics.

Members of the Subcommittee then reminded the Agency of the recommendation in the February 1999 HEES Advisory (EPA-SAB-Council-ADV-99-005) to develop an example of a benefits assessment for a high-risk hazard air pollutants using specific criteria. Dr. Lioy recommended that the Agency consider benzene, because it is a human carcinogen, is widely distributed, and is well-researched as a first example. Other members suggested that an example also be provided for ecological benefits, where ecological benefits are significant (e.g., mercury or dioxin).

The HEES discussion touched on additional topics related to air toxics. Members suggested that data collected at proposed new monitoring sites could be supplemented by the new PM Super Sites Monitoring Network and the independent, EPA-sponsored PM speciation network. Dr. Freeman discussed forthcoming guidance, being developed by EPA's Office of Policy and under review by the Environmental Economics Advisory Committee, on the economic benefits of air toxics and regional distribution of benefits.

The HEES concluded its consideration of hazardous air pollutants with a discussion of the ASPEN model. In response to a question from the Subcommittee, Mr. DeMocker confirmed that the exposure component of the ASPEN model had not been validated. The Subcommittee suggested that the Agency request that the Integrated Human Exposure Committee of the SAB review of the ASPEN model to assess its utility for exposure and benefits assessments. Dr. Lioy suggested that such a review would need to engage additional expertise beyond HEES because of critical questions about the reliability and uncertainty of the model.

Action item:

3. The HEES will recommend that the SAB Executive Committee form a special subcommittee, perhaps with members from the Environmental Health Committee, the Integrated Human Exposure Committee and the HEES, to consult with the Agency on whether and how to make consistent estimates of hazardous air pollutants and criteria pollutants

The Committee scheduled its next meeting for:

June 28-29, 1999

Topic: Review of Draft *Prospective Study: Report to Congress*

At 12:45 pm on Wednesday, April 22, 1999, Dr. Paul Lioy adjourned the

meeting.

Respectfully Submitted:

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(Name)
Designated Federal Official

Certified as True:

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(Name), Chair
Committee